ID; 88076767

Box 15
Item 15-09,07

Las Cienegas National Conservation Area's Ecological Monitoring & Adaptive Management Program

The Las Cienegas National Conservation Area (LCNCA) supports three of the rarest ecosystems in the American Southwest: riparian, aquatic, and semidesert grassland; is home to 7 endangered species; and has 2 proposed wild and scenic river segments. The LCNCA's 49,000 acres of BLM land are managed for multiple uses including conservation, recreation, and livestock grazing. BLM also holds the State grazing leases on an additional 80,000 acres of intermixed Arizona State Trust Land.

In response to its exceptional biological, cultural, and scenic values, the BLM has committed to implementing a science-based adaptive management program at Las Cienegas. The LCNCA Resource Management Plan (RMP) sets out numerous clear, measurable management objectives; however, when the RMP was finalized in 2003, it proposed evaluation and modification of the existing monitoring program to ensure that it could adequately measure progress towards RMP objectives. BLM entered into a cooperative agreement with The Nature Conservancy in 2004 to evaluate the current condition of natural resources on LCNCA and to review existing monitoring protocols with respect to management objectives.

The first phase of this project addressed adaptive management needs of the upland watershed. The second phase has focused on stream systems and includes reports on the endangered Gila topminnow as well as riparian and aquatic habitats. Pending funding for a third phase of the project, future chapters will address additional special status upland and riparian target species. Highlights of monitoring objectives and results, recent or proposed changes, and adaptive management responses are presented below. Completed full reports can be found at http://www.azconservation.org; public presentations and drafts of remaining reports can be requested from Karen_Simms@BLM.gov.

Highlights of native grassland monitoring

Since 1995, BLM and collaborators have measured a combination of plant species' frequency and composition by weight, substrate cover, and the NRCS rangeland similarity index ratings to gage grassland health. Key upland resource objectives include:

- Maintenance of <30% exposed soil surface (bare ground) in grassland communities. This objective is established in the RMP to guard against soil erosion and is recognized as an ecologically important threshold in semidesert grasslands.
- Maintenance of >10% live basal cover of perennial grasses. This objective was chosen by the Las Cienegas Technical Review Team (TRT) in 2003 as an interim standard for grasslands pending their development of specific objectives for each ecological site type.

Analysis of upland monitoring data collected between 1995 and 2003 on 30 monitoring plots on the Empire-Cienega Allotment showed that:

- 74% of key areas met RMP objectives for bare ground cover and/or the Similarity Index value in 2004 or the date of last measurement.
- 35% of key areas showed improving conditions and 48% showed declining conditions.

To place these results into an ecosystem management context, we developed a state-and transition model for semidesert grassland that identifies important thresholds in vegetation composition between model states as well as management actions capable of moving vegetation from one state to another.

- Analysis of overall grassland condition using 10 condition indicators indicated that 66% of key areas were *moderately* or *greatly outside desired condition* due to low perennial grass cover, shrub encroachment, and increased potential for soil erosion.
- Few key areas (33%) fell within Open Grassland, a vegetation state that historically predominated at LCNCA while more key areas (46%) have been encroached upon by shrubs but can be restored back to Open Grassland using prescribed fire or mechanical/herbicide treatments.

We identified modifications to the original upland monitoring program that would improve protocols' ability to detect biologically-meaningful changes in grassland variables, and evaluate progress towards RMP management objectives. These included:

- Expanding plot layouts at each key area and increasing cover points from 100 to 1000, greatly improving the power of the protocol to detect change;
- Establishing base line data collection on shrub cover and tree density, to be repeated every five and ten years respectively;
- Deemphasizing pace frequency measurements that do not tie directly to RMP objectives. These changes resulted in no net increase in the annual monitoring effort on a per key area basis and only slightly increased the effort for 5- and 10-year interval monitoring.

Modified protocols have been used since 2004. These modifications have met with increasing approval by all parties involved as new data has shown continuity with earlier datasets and as results have documented important grassland changes. Assistance from the University of Arizona Range Club has enabled BLM to continue collecting pace-frequency data from about 1/3 of the key areas each year.

Las Cienegas' adaptive management program has made increasingly active use of upland monitoring data to inform decisions about grazing numbers and rotations. This program also uses monitoring data to help resolve potential conflict over upland resources:

- The grazing permittee uses monitoring information to help plan his intended pasture rotation before submitting plans to the BLM. The Rangeland Resource Team and Technical Review Team, through the Las Cienegas Biological Planning process, then review this data before making recommendations about the proposed grazing plan, paying special attention to sites for which monitoring shows dramatic or chronic cover changes.
- Timing of data collection and Biological Planning meetings have been modified so concerns can be resolved before the permittee has to make decisions on sale or purchase of cattle.
- Difficulty of separating the effects of grazing from other factors such as climate or shrub encroachment prompted BLM to construct eight new paired exclosure-grazed study sites in 2006. This will help ensure that management debates can be grounded in solid information rather than ideology.

- The link found between sites with high shrub cover and low grass cover prompted the Rangeland Resource Team and Technical Review Team, through the Biological Planning process, to push for a comprehensive plan to combat shrub encroachment on Las Cienegas.

Highlights of LCNCA's riparian and aquatic monitoring

Aquatic Habitats

Healthy stream habitats on Las Cienegas are crucial to the survival of the site's three endangered fish and frog species, and are being monitored in several ways.

- Analysis of two extensive rounds of habitat measurements (1990 and 2000) show that pools have deepened, the stream has narrowed, and aquatic vegetation cover and undercut banks have increased. All of these parameters indicate improved stream health from reduced erosion and stabilized stream banks. Minor changes in location of repeat sampling sites will be required to align sampled segments with the reaches for which the RMP specifies quantitative objectives.
- "Cienega" marsh habitats have expanded and now meet the RMP's target for proportion of the stream composed of this habitat type. However, measuring cienega health will require development and testing of health criteria and measurement protocols for this unique habitat type.
- Streamflow appears to have declined since the early 1990's, but the data leaves room for interpretation because measurements were taken in different ways at different locations through the years. The current stream gage was installed in 1995 but its data is available only for the last six years. We are working to digitize the gage's earlier data to track changes from before, during, and after recent drought.
- This summer will mark the second annual wet-dry walk to document changes in extent of perennial surface water. Less formal observations during the 1990's suggest that Cienega Creek has lost 4km of surface flow in recent years—one third of its total on Las Cienegas. Formal monitoring will enable BLM and partners to more accurately track declines and recovery of surface water.

Natural and man-made off-channel ponds and wetlands provide critical resources for native species but can also serve as reservoirs for invasive aquatic species. The LCNCA RMP addresses both elements, so monitoring must as well:

- Upland waters within BLM's planning boundary were inventoried in 1990; many were screened for native and non-native fish and frogs. Non-native fish were found in two private stock ponds, one of which also now has invasive crayfish.
- Proliferation of manmade upland waters, expansion of non-natives in nearby streams, and growth of surrounding communities all raise the importance of repeating these surveys and expanding them to the entire watershed so that invasives can be combated effectively.
- This summer's fieldwork will involve more agency and private partners to begin mapping and screening all potentially permanent waters throughout the Cienega watershed. Together we are seeking funds to implement this expanded monitoring and to incorporate management responses, including removing non-natives when

they are found, retrofitting waters to benefit native species without harboring invasives, and training volunteers to re-visit key sites through time.

- Future development of health criteria and protocols for cienega systems will also enable BLM to monitor overall ecological condition of off-channel natural wetlands.

Riparian habitats

Riparian habitats support at least two endangered species on this site (Huachuca water umbel and Southwestern willow flycatcher), as well as a large proportion of the area's 60 mammals and 230 bird species. Riparian monitoring addresses general functional conditions, extent and composition of riparian forests, and channel geomorphology.

- BLM's Riparian Proper Functioning Condition (PFC) assessments of Cienega Creek and its tributaries in 2000 found that 61% of stream miles were in PFC and 39% were Functional at Risk, a substantial improvement from 1993 when only 2% of stream miles were rated PFC.
- Similarly, BLM's Riparian Area Condition and Assessment (RACE) measurements show that the percentage of Cienega Creek stream miles rated as satisfactory increased from 43 to 71 to 92 percent (1989, 1993, and 2000 respectively). Early changes coincide with stream fencing and reflect improved woody species regeneration. Bank stability improvements took longer to manifest and are responsible for most of the RACE score changes from 1993 to 2000.
- Riparian photopoints and aerial photos images show a dramatic expansion of riparian cottonwood-willow forest since 1989. Measuring the extent of this expansion will require spatial analysis of available remote images.
- Belt transects begun in 1993 and repeated in 2006 show dramatic increases in riparian tree densities along with shifts in age structure and species composition. Belt transects proved to be efficient, repeatable, and adequate for documenting changes in all but the largest size class (>20" diameter). Counting these largest trees between belts would reveal changes in large trees as well.
- Channel cross-sections measured in 1993 and repeated in 2006 showed stability in several sensitive areas and aggradation in the upper reach, raising the channel surface some three feet towards its original floodplain.

Other aspects of riparian monitoring will benefit from minor changes.

- An extensive geomorphology study done by Arizona Department of Environmental Quality in 2001 will enable us to choose additional cross section points that have baseline data in order to track changes at headcuts and other sensitive spots.
- Protocols to track changes in specific riparian zones need improvement. Existing "ecosite" zonation measurements yielded inconsistent results and will be replaced or changed. Protocols for measuring herbaceous vegetation still need to be tested here.
- Currently, monitoring for riparian vegetation, native fish, aquatic habitat, and floodplain geomorphology and associated photopoints are scattered up and down Cienega Creek. We are working on a proposal to consolidate many of these measurements into a single set of locations while maintaining the ability to compare

past and future data. Co-locating measurements will reduce travel time, increase staff's ability to use volunteer teams to conduct measurements, and enhance the integration and interpretation of monitoring results (e.g. floodplain cross-section monitoring can be used to understand changes in riparian vegetation and native fish populations).

Endangered fish

Las Cienegas harbors the nation's most extensive natural population of endangered Gila topminnow uncontaminated by non-native predators, as well as one of the few populations of endangered Gila chub considered protected and stable. Analysis of 15 years of topminnow-focused fish monitoring data showed that:

- The LCNCA has successfully prevented contamination of Cienega Creek and its major tributaries by invasive fishes that have devastated native species throughout the region;
- Gila topminnow continue to be present in both upper and lower perennial reaches of Cienega Creek, and remain abundant in some sites. Gila chub also continue to survive and reproduce in both reaches.
- Gila topminnow densities in the upper reach have declined dramatically. Lower reach sites have not suffered such extreme drops, but highly variable fish counts make it difficult to reliably determine whether topminnow populations in this lower reach have been stable, decreasing, or even increasing through time.

We identified modifications to the existing Gila topminnow monitoring program that can improve the program's efficiency as well as reliability and timeliness of results:

- Increasing sampling stations in the lower reach from 4 to 16 will improve detection of population changes in what has become the species stronghold, with only a modest increase in effort. Reducing uninformative habitat measurements will enable staff to sample more efficiently.
- Refocusing upper reach monitoring on screening for exotic species and tracking topminnow distributions rather than abundance will reduce effort in this reach while still enabling early detection of exotics and revealing major topminnow changes.
- Shifting topminnow trend sampling to every-other-year will substantially reduce effort without undermining power to detect change, and will enable staff to satisfy other needs in alternate years.
- Together, these changes decrease estimated staff time commitments for topminnow monitoring per two years from 16 days (current) to 10 days, freeing up resources for other monitoring and management needs.

As the next step in the adaptive management cycle, the Sonoita Valley Planning Partnership is convening a group of desert fish experts and riparian specialists to discuss possible management responses to the topminnow declines observed in the upper reach of Cienega Creek. Causes of these declines are unclear but may include drought and habitat changes from lack of disturbance. We are working with University of Arizona fish researchers to develop ecological models and design management experiments that will help guide management response by shedding light on these or other potential causes.

For more information contact Karen Simms, Ecosystem Planner, Las Cienegas NCA
(520)258-7210. Karen_Simms@blm.gov